

DERWENT-ACC-NO: 1995-171062

DERWENT-WEEK: 199523

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TITLE: Denitrification and desulphurisation of waste gas esp. from combustion

without evapn. stage - by scrubbing with aq. ammonia soln., decomposing nitrite

to nitrogen and water and oxidising sulphite to sulphate with oxygen in gas in

hot zone after separating condensed sulphuric acid

INVENTOR-NAME: REMSTEDT, H

PRIORITY-DATA: 1993DE-4335867 (October 21, 1993)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
PAGES	MAIN-IPC	
DE 4335867 A1	May 4, 1995	N/A
004	B01D 053/34	

INT-C (IPC): A62D003/00; B01D005/00 ; B01D051/10 ; B01D053/14 ;

B01D053/34 ; B01D053/86 ; F23J015/04 ; G05D021/00

ABSTRACTED-PUB-NO: DE 4335867A

BASIC-ABSTRACT: In the conversion of NO<sub>x</sub> and SO<sub>x</sub> into harmless waste gas

constituents or crystals for removal of ammonium salts, the crude waste gas (I)

is freed from H<sub>2</sub>SO<sub>4</sub> condensate (II) by cooling.

After cooling to 30-50deg.C, the NO is (partly) oxidised to NO<sub>2</sub> to improve the solubility. Removal of (II) and oxidn are carried out in the presence of an active compsn.

SO<sub>2</sub> and NO<sub>x</sub> are scrubbed out with aq NH<sub>3</sub> soln at 30-50deg.C in an absorber, pref. with a dwell of 1-10 s and pH of 6-9. The pretreated gas enters the hot zone of the absorber, where (NH<sub>4</sub>)<sub>2</sub>SO<sub>3</sub> formed by absorption is oxidised to (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> by the O<sub>2</sub> in (I), whilst the dissolved NO<sub>x</sub> is converted to NH<sub>4</sub>NO<sub>2</sub>, which is decomposed to N<sub>2</sub> and H<sub>2</sub>O in the hot zone, in which esp. the temp. is 60-90deg.C and dwell 10-120 min. The hot zone is below the cold zone and the



gas flows upwards, in countercurrent to the soln., so that a temp. and pH zone suitable for absorption, decomposition and oxidn. is obtd. in a suitable position in the absorber.

These processes need not proceed to completion, since they begin again when the absorption soln is recycled. Decomposition of  $\text{NH}_4\text{NO}_2$  is favoured by the required acid pH by formation of  $(\text{NH}_4)_2\text{SO}_4$  from recycled (II) and from oxidn of  $(\text{NH}_4)_2\text{SO}_3$ .

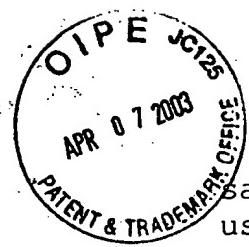
$(\text{NH}_4)_2\text{SO}_4$  and opt. double ammonium sulphate-nitrate (if  $\text{NO}_2$  is present in excess of  $\text{NO}_2$ ) is pptd. form the circulating soln continuously in a crystalliser and the crystals are sepd. after a dwell of up to 4 hrs., whilst the remaining mother liquor is recycled, esp. after adding fresh NH<sub>3</sub> to convert  $\text{NH}_4\text{HSO}_3$  to  $(\text{NH}_4)_2\text{SO}_3$  for layer absorption and dilute the mother liquor satd with  $(\text{NH}_4)_2\text{SO}_4$ , so that no crystallisation occurs in the pipe.

The cold purified waste gas is freed from residual NH<sub>3</sub> and give a moisture content higher than the original by scrubbing with (II). To ensure that it takes up a suitable amt. of water, the gas may be heated with warm cooling water, heated by heat exchange with (I), before passing through (II) to the flue.

The amt. and/or rate of circulation is increased to buffer variations in the impurity concn. or amt. of (I) by a corresp. excess of absorption soln.: Automated control is possible.

USE - The process is useful for removing NO<sub>x</sub> and SO<sub>x</sub> from (I) from combustion.

ADVANTAGE - The process avoids the need for concn. by evapn. to crystallise



salts; uses (II) for removing residual NH<sub>3</sub> or salts; and uses the O<sub>2</sub> in (I) for oxidising SO<sub>2</sub> and NO; and avoids the need for 100% oxidn. by recycling the absorbent.

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In the conversion of NO<sub>x</sub> and SO<sub>x</sub> into harmless waste gas constituents or crystals for removal of ammonium salts, the crude waste gas (I) is freed from H<sub>2</sub>SO<sub>4</sub> condensate (II) by cooling.

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After cooling to 30-50deg.C, the NO is (partly) oxidised to NO<sub>2</sub> to improve the solubility. Removal of (II) and oxidn are carried out in the presence of an active compsn.

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SO<sub>2</sub> and NO<sub>x</sub> are scrubbed out with aq NH<sub>3</sub> soln at 30-50deg.C in an absorber, pref. with a dwell of 1-10 s and pH of 6-9. The pretreated gas enters the hot zone of the absorber, where (NH<sub>4</sub>)<sub>2</sub>SO<sub>3</sub> formed by absorption is oxidised to (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> by the O<sub>2</sub> in (I), whilst the dissolved NO<sub>x</sub> is converted to NH<sub>4</sub>NO<sub>2</sub>, which is decomposed to N<sub>2</sub> and H<sub>2</sub>O in the hot zone, in which esp. the temp. is 60-90deg.C and dwell 10-120 min. The hot zone is below the cold zone and the gas flows upwards, in countercurrent to the soln., so that a temp. and pH zone suitable for absorption, decomposition and oxidn. is obtd. in a suitable position in the absorber.



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(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and opt. double ammonium sulphate-nitrate (if NO<sub>2</sub> is present in excess of NO) is ptd. form the circulating soln continuously in a crystalliser and the crystals are sepd. after a dwell of up to 4 hrs., whilst the remaining mother liquor is recycled, esp. after adding fresh NH<sub>3</sub> to convert NH<sub>4</sub>HSO<sub>3</sub> to (NH<sub>4</sub>)<sub>2</sub>SO<sub>3</sub> for layer absorption and dilute the mother liquor satd with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, so that no crystallisation occurs in the pipe.

Basic Abstract Text - ABTX:

The cold purified waste gas is freed from residual NH<sub>3</sub> and give a moisture content higher than the original by scrubbing with (II). To ensure that it takes up a suitable amt. of water, the gas may be heated with warm cooling water, heated by heat exchange with (I), before passing through (II) to the flue.

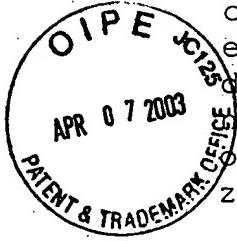
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ADVANTAGE - The process avoids the need for concn. by evapn. to crystallise salts; uses (II) for removing residual NH<sub>3</sub> or salts; and uses the O<sub>2</sub> in (I) for oxidising SO<sub>2</sub> and NO; and avoids the need for 100% oxidn. by recycling the absorbent.

Derwent Accession Number - NRAN:

1995-171062

Title - TIX:



Denitrification and desulphurisation of waste gas esp. from combustion without evapn. stage - by scrubbing with aq. ammonia soln., decomposing nitrite to nitrogen and water and oxidising sulphite to sulphate with oxygen in gas in hot zone after separating condensed sulphuric acid

Standard Title Terms - TTX:

DENITRIFICATION DESULPHURISE WASTE GAS COMBUST EVAPORATION STAGE SCRUB AQUEOUS

AMMONIA SOLUTION DECOMPOSE NITRITE NITROGEN WATER  
OXIDATION SULPHITE SULPHATE

OXGEN GAS HOT ZONE AFTER SEPARATE CONDENSATION SULPHURIC ACID